1. Active Noise Control (ANC) refers to the process whereby one or more “anti-noise” signals are reproduced by loudspeakers in an attempt to reduce or eliminate certain undesired sounds in an acoustical environment. The term “active” generally refers to systems where the cancellation is done using sound pressure waves in the physical environment. A great deal of related work has been done on “adaptive noise cancelling”, which may operate “offline”, purely in the mathematical or electronic realm.

2. Find canceller coeffs to minimize sum of square undesired signal components at the listener.

As long as undesired and desired are uncorrelated, its mathematically equivalent to minimize the total sound power at the listener based on the undesired reference signal.

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3. Block Diagram of Mathematical Model for ANC

4. Although, in general, ANC may be realized as a Multiple Input-Multiple Output (MIMO) system, the mathematical model is shown for only a single input and single output, for simplicity.

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**• Qi**

* + **image source strength**

**• ri**

* + **source distance**

**• Delta-function generates a peak in IR at arrival time ri / c**

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**Least mean squares (LMS)** algorithms are a class of [adaptive filter](https://en.wikipedia.org/wiki/Adaptive_filter) used to mimic a desired filter by finding the filter coefficients that relate to producing the least mean squares of the error signal (difference between the desired and the actual signal). It is a [stochastic gradient descent](https://en.wikipedia.org/wiki/Stochastic_gradient_descent) method in that the filter is only adapted based on the error at the current time.

**Stochastic gradient descent** is a gradient descent optimization [method](https://en.wikipedia.org/wiki/Iterative_method) for minimizing an [objective function](https://en.wikipedia.org/wiki/Objective_function) that is written as a sum of differentiable functions.